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NOTES ON GEOGRAPHIC DISTRIBUTION

Plantae, Magnoliophyta, Gentianales, Apocynaceae, Asclepiadoideae, *Ceropegia hookeri*: Distribution and rediscovery in eastern Himalayas, Sikkim, India

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The Eastern Himalayan region is home to several rare flora (Rao 1994). Floristically the region acts as a gateway for the migration of flora from the adjacent countries such as China, Japan, Nepal and Bhutan. The Khangchendzonga Biosphere Reserve (KBR) in Sikkim is an important phytodiversity centre in Eastern Himalayas due to its unique geographical position. During the floristic exploration of KBR, *Ceropegia hookeri* (Figure 1) was collected. The genus *Ceropegia* L. comprises 200 species distributed from southern Africa to Australia (Bruyns 2003). In India, the genus is represented by 48 species and three varieties (Malpure et al. 2006). From north-eastern India including the eastern Himalayas, nine species have so far been reported (Jagtap and Singh 1999).

Ceropegia hookeri has not been reported by any other worker in eastern Himalayas since its first discovery by Clarke in 1909 from Zemu valley in North Sikkim (Nayar and Sastry 1988). It is endemic to Himalayas, restricted to the state of Sikkim in India and Tibet. So far, the species is represented by only two collections, and both the reports dated back to 19th century. Other than the Zemu valley collection of Clarke, the species was also collected from the Trans-Himalyan region of Tibet in 1945 (Botanical Survey of India Herbarium, Calcutta). After a critical examination and comparison with original description, the identity of the species was confirmed as *Ceropegia hookeri* (Hooker 1885). The voucher specimen has been deposited in the herbarium of Department of Botany, North-Eastern Hill University, Shillong, India. The species was classified as endangered both in the Red Data Book (Nayar and Sastry 1988) and in the IUCN Red list of threatened plants (Walter and Gillett 1997).

Taxonomic Information

Ceropegia hookeri Clarke ex. Hook. f. (Figure 1). A straggling herb, *ca.* 45 cm in length. Stem slender, softly woody; petioles, lamina on both surfaces and peduncles are sparsely pubescent. Leaves ovate to lanceolate, long pointed, 2.5-5 cm x 2-2.5 cm, pubescent, membranous; petiole short, 0.6-0.9 cm. Cymes few flowered (1-3); sepals linear-lanceolate, 3-4.5 x 0.6-1 mm, glabrous. Corolla short, glabrous, more or less straight, dark purple, tube *ca.* 1.5 cm long, lower half inflated with hairs in the middle, base whitish, lobes *ca.* 0.7 cm long, gently curved forming a short ellipsoid crown. Peduncles short, longer than the petioles, pilose. Outer corona reduced to ciliate flanges, inner lobes linear-oblong. Fruit a pair of follicles, 2-5 cm in length.
Distribution: Endemic to Himalayas.
Flowering: June-September.

Species Accounts

Previous record from India: Clarke (1885), Ansari (1984) and Ansari (1988).
New record locality from India: Present work (Acronym and Accession No. NEHU-11874 and 11875), 12 November, 2008, from district of West Sikkim, KBR (27°22'12.48" N, 88°06'42.42" E; 27°22'25.92" N, 88°06'21.72" E).
Status: Endangered as mentioned by Nayar and Sastry (1988). However, considering population size and the extent of distribution, following IUCN 2009:2001 categories & criteria (Version 3.1), the species may be reclassified as "Critically endangered" (CR A3bc; B2ab(ii,v)) (Table 1).

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Remarks: It was found at an elevation of 3100 m a.s.l. in temperate broad leaved forest of Akarey Vir area in KBR of West district in Sikkim (Figure 2). The specimen is often confused with *Ceropegia pubescens* Wall., which is also found in the same habitat along with *C. hookeri*. However, critical examination of both the species reveals several striking differences (Table 2).

The habitat of *C. hookeri* within the KBR is increasingly exposed to disturbance as it falls along the trekking corridor of the tourists. Forest fragmentation due to felling of trees for fodder and small timber, and grazing by cattle and sheep are the other causative factors threatening the existence of the species in its natural habitat. In view of high intensity of disturbance to its natural habitat, the species might be extinct in the near future, unless adequate conservation measure for the species is taken.

Figure 1. (a) *Ceropegia hookeri* in natural habitat; (b) Flower; (c) Leaves; (d) Leaves and fruits; (e) Corona and (f) Lobes inner view.

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The species can be conserved *in situ* through habitat protection as well as undertaking several *ex situ* conservation measures such as multiplying and introducing the species in the wild through micropropagation, establishing field gene banks and conserving the species in the existing institutional botanical gardens. Since the flower is beautiful, attractive and with a unique shape, the species may be planted in the gardens and may be multiplied and exploited as a commercial horticultural plant. For example, it may be planted in the experimental botanical garden of Botanical Survey of India, Himalayan Circle, Gangtok and in Kyongnosla alpine sanctuary under the control of the State Forest Department to ensure its perpetuation.

The species reported a century back from North district of Sikkim is now rediscovered from West district of Sikkim, showing the extension of its distributional area. However, the species could not be located from its earlier reported area, in the Zemu valley, about 10 km north of Lachen in North Sikkim. The rediscovery of the species from the west district not only confirmed the extension of the geographical distribution of this species but also ensured the continued existence of it. The plants were growing in moist habitats both in undercanopy and open meadows. The associated species were *Arundinaria maling* Gamble, *Colquhounia coccinea* Wall., *Gaultheria fragrantissima* Wall., *Ilex dipyrena* Wall., *I. fragilis* Hook. f., *Lithocarpus pachyphylla* (Kurz) Rehder, *Paris polyphylla* Sm., *Piptanthus nepalensis* (Hook.) D. Don, *Rhododendron* spp., *Symplocos ramosissima* Wall. ex G. Don and *Zanthoxylum oxyphyllum* Edgew.

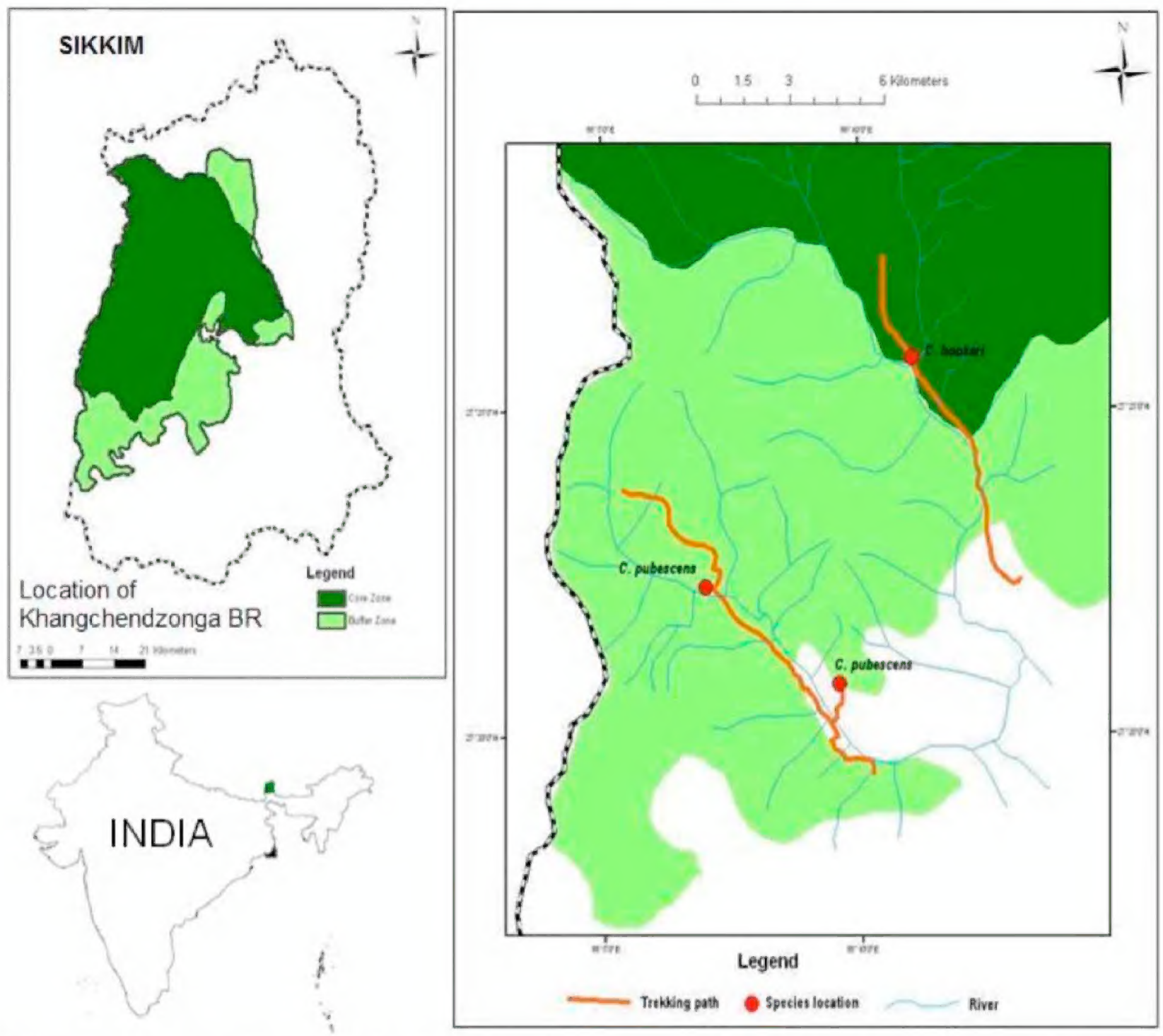

Figure 2. Location map of *Ceropegia hookeri* and *C. pubescens* in Khangchendzonga Biosphere Reserve (KBR) in Sikkim.

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Table 1. Population data of *Ceropegia hookeri* used for classification of threatened category under IUCN, version 3.1.

A. Population size	**3)** Ā8% decline per generation **b)** Density per m^2: 3 individuals **c)** Quality of habitat: Fragmented, grazing and trampling
B. Geographic range	**2)** Area of occupancy (< 10 km^2) **a)** Severely fragmented, single location **b)** Continuing decline **ii)** Area of occupancy: 100 m^2 **v)** Number of mature individuals: 40-50

Table 2. Differences between *Ceropegia hookeri* and *Ceropegia pubescens*.

Ceropegia hookeri	***Ceropegia pubescens***
Found in temperate forest	Found in subtropical forest
A straggling herb, about 45 cm in length	A straggling herb, more than 45 cm in length
Leaves long pointed, 2.5-5cm x 2-2.5cm, pubescent	Leaves short pointed, long stalked, 8-18 cm
Cymes few flowered	Cymes many flowered
Flower dark purple	Flower green spotted with lobes yellow
Corolla short, straight, *ca* 1.7 cm	Corolla long, curve, 3-4 cm long
Fruit shorter	Fruit longer

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